

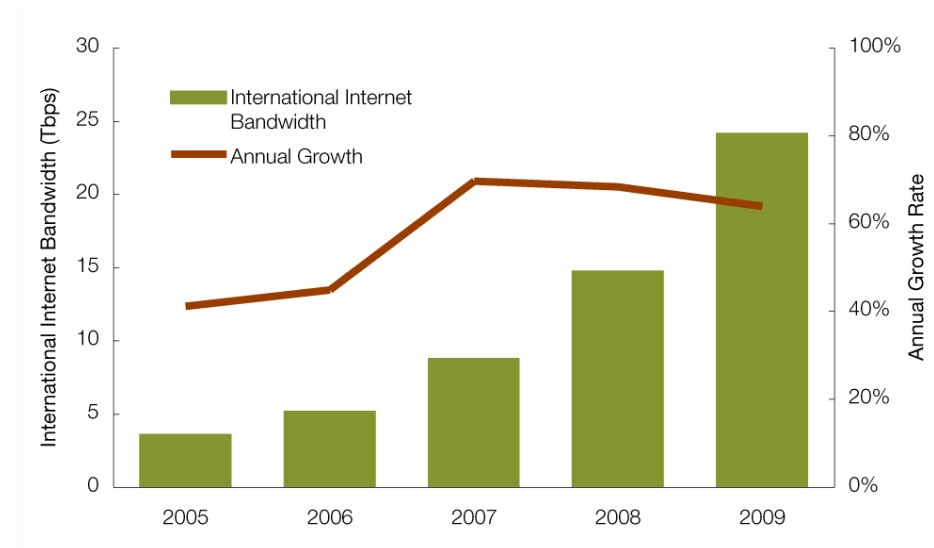
Executive Summary

While a brutal recession led to the contraction of many of the world's economies, networks that comprise the global Internet backbone continued their expansion. Traffic volumes continued to soar in 2009, with annual growth rates in the triple-digits for many developing countries. Global Internet backbone operators are responding to this traffic growth by deploying staggering amounts of new capacity. The strong pace of demand is helping to offset the continued erosion of IP transit prices, which have declined by 20 to 30 percent annually since 2007 in major hub cities. TeleGeography's *Global Internet Geography Research Service* provides analysis and statistics on Internet capacity and traffic, IP transit pricing, and backbone operators.

Internet Traffic and Capacity

TeleGeography's annual survey of Internet backbone operators tracks Internet capacity deployments as well as peak and average network traffic volumes. Since 2007, the annual growth rate of capacity has exceeded 60 percent. In 2009, international Internet bandwidth increased 64 percent, as backbone operators upgraded their networks to handle rapidly growing traffic volumes (see Figure: International Internet Bandwidth, 2005-2009). In 2009, network operators added 9.4 Tbps of new capacity—exceeding the 8.7 Tbps in existence just two years earlier.

FIGURE 1
International Internet Bandwidth, 2005–2009



Notes: Data represent Internet bandwidth connected across international borders as of mid-year. Domestic routes are excluded.

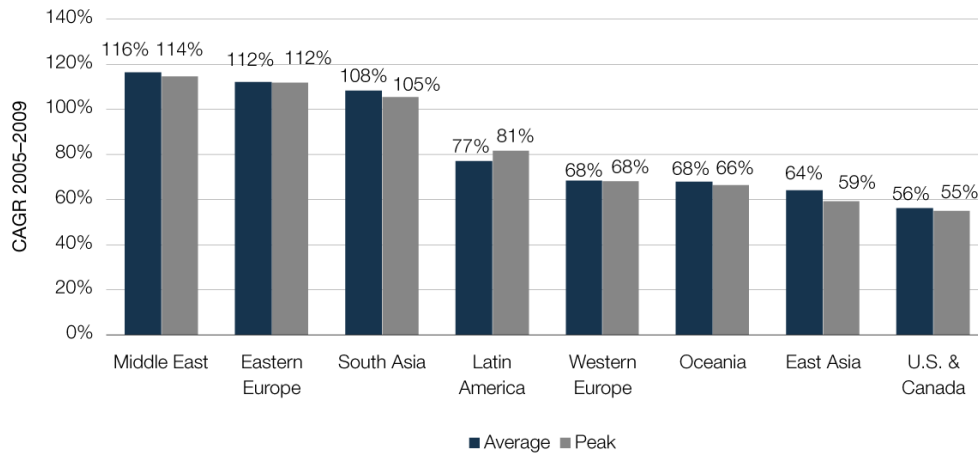
Source: TeleGeography research

© 2009 PriMetrica, Inc.

The pace of international Internet traffic growth shows few signs of slowing. In fact, international traffic growth accelerated in 2009, as average traffic grew 74 percent, well above the 55 percent growth measured in 2008. Peak traffic volumes increased 79 percent in 2009, compared with 61 percent in 2008. South Asia, the Middle East, and eastern Europe grew most rapidly. Between 2005 and 2009, all three regions experienced peak and average international Internet traffic growth of more than 100 percent annually (see Figure: Average and Peak Traffic Growth by Region, 2005–2009 (CAGR)). The pace of traffic in other regions is far from slow either. Between 2005 and 2009, average and peak traffic on international links connected to the U.S. & Canada increased at a compound annual rate of 56 and 55 percent, respectively.

FIGURE 2

Average and Peak Traffic Growth by Region, 2005–2009 (CAGR)



Notes: Data reflect utilization of Internet bandwidth connected across international borders including links between countries in each region. Data is the compound annual growth rate between mid-2005 and mid-2009.

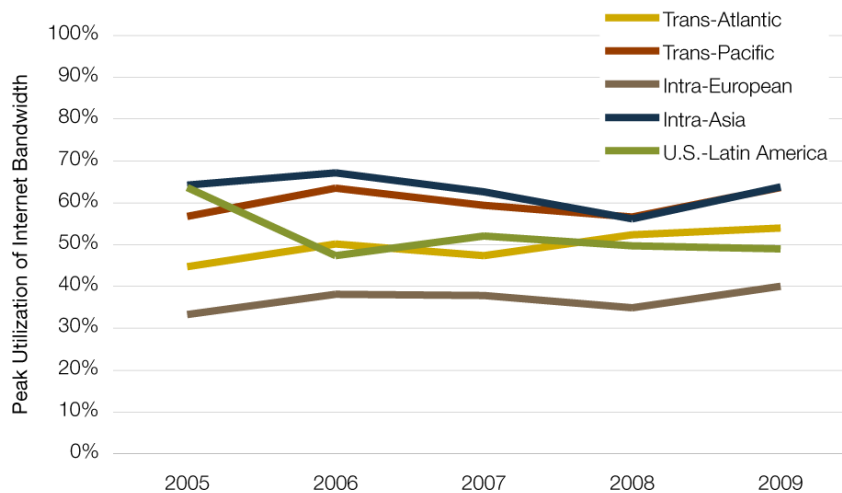
Source: TeleGeography research

© 2009 PriMetrica, Inc.

Internet traffic has grown more slowly on domestic U.S. routes than it has on international links connecting to the United States. For the top 20 highest-capacity U.S. routes, average Internet traffic increased 36 percent between 2008 and 2009, while peak traffic grew 33 percent. Network capacity increased 37 percent, keeping pace with traffic growth.

The pace of traffic growth exceeded the growth of underlying network capacity, resulting in a modest rise in global utilization rates for the first time since 2006 (see Figure: Peak Utilization by Route, 2005–2009). However, network utilization rates have defied predictions that networks would be overwhelmed by skyrocketing traffic growth and a lack of investment in new capacity. Current utilization rates are far from reaching dangerously high levels on most networks. Less than a quarter of the carriers surveyed by TeleGeography have allowed peak utilization to increase on their networks in order to defer incurring upgrade expenses.

FIGURE 3
Peak Utilization by Route, 2005-2009



Notes: Data reflect peak traffic over Internet bandwidth connected across international borders. Data as of mid-year.

Source: TeleGeography research

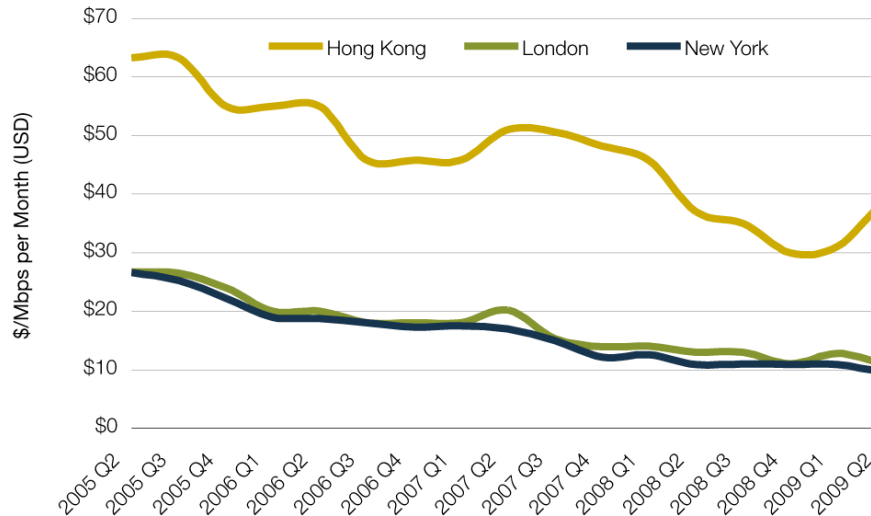
© 2009 PriMetrica, Inc.

Prices

Only a small handful of the world's largest Internet service providers are able to exchange all of their traffic via unpaid peering relationships. All other service providers must rely on wholesale Internet connectivity, called IP transit, from other backbone providers to deliver at least a portion of their traffic. TeleGeography has conducted a quarterly survey of wholesale Internet service providers in key telecom hub cities around the world since 2003 to track IP transit pricing trends.

FIGURE 4

Median GigE IP Transit Prices in Major Global Cities, Q2 2005-Q2 2009



Notes: Each line is the median monthly price per Mbps in that city. Data exclude installation and local access fees. Gigabit Ethernet (GigE) = 1,000 Mbps. Historical prices received in another currency were converted using the June 2009 average exchange rates.

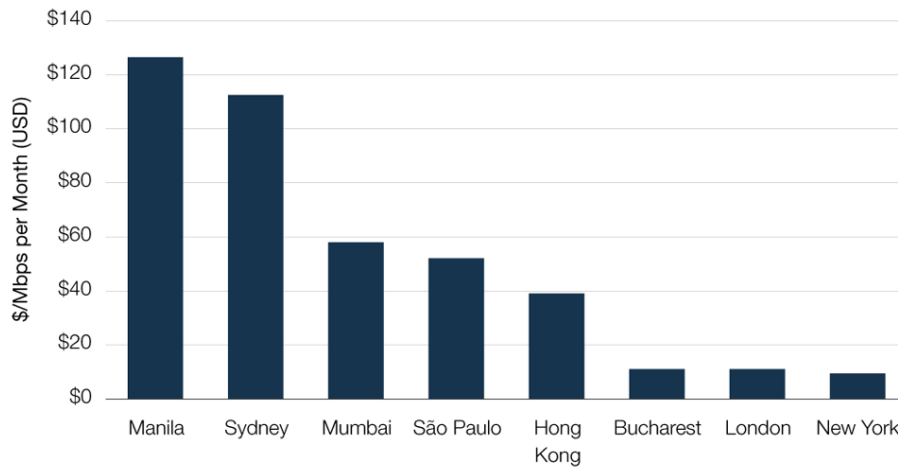
Source: TeleGeography research

© 2009 PriMetrica, Inc.

IP transit prices continue to decline around the globe, even in relatively mature markets. Over the past three years, the median price of a fully committed GigE port in the major cities of Europe and North America has fallen at a compounded rate of approximately 20 percent annually. Prices of GigE ports in major Asian cities have fallen at a compounded rate of 10 to 35 percent over the past 3 years, and GigE prices in major Latin American cities have fallen between 30 and 40 percent annually over the same period.

IP transit prices vary widely by region. At mid-year 2009, the median price of a fully committed GigE IP transit port was approximately \$11 per Mbps in Europe and \$9 in North America (see Figure: Median GigE IP Transit Prices in Major Global Cities, Q2 2005-Q2 2009). Prices outside North America and Europe tended to be far higher. The median price of a fully committed GigE port in Q2 2009 was \$58 in Mumbai and \$127 in Manila. In Africa, GigE ports are almost unheard of, and the price of IP transit often exceeds \$1,000 per Mbps per month.

FIGURE 5
Median GigE IP Transit Price by City, Q2 2009



Notes: Prices represent median monthly price per Mbps for a fully committed GigE port in Q2 2009.

Source: TeleGeography research

© 2009 PriMetrica, Inc.

Outlook

While the global recession has, thus far, only had a modest impact on the global Internet, considerable challenges remain for network operators.

Staying Ahead of Demand

Broadband penetration rates are far from reaching saturation levels in much of the world. Even in more mature markets where the pace of broadband subscriber growth has slowed, increasing access rates and bandwidth intensive applications—such as video services—have spurred higher traffic generation per user. Traffic growth forces operators to invest in new capacity constantly to avoid overloading their networks.

Plunging Prices

The rate of demand growth has outpaced the rate of IP transit price declines, which implies growing revenue, but costs remain a critical factor. IP transit costs include network operations and network equipment, including IP routers and optical transport gear. Unit costs have declined as network scale has expanded. As long as unit costs continue to decline, they will continue to support margins for falling prices. In addition to absolute price declines of IP transit ports, the weighted average total market price of IP transit service will continue to decline as buyers transition from low-capacity ports, which have a higher unit price, to high-capacity ports, which have a lower unit price.

Growing Complexity

Backbone operators face new challenges to their traditional IP transit businesses. The increased use of content distribution networks (CDNs), such as Akamai and Limelight, is shifting some traffic away from transit providers' networks, as CDNs directly connect their networks to access networks. Transit providers are trying to participate in the CDN market themselves. Nearly all the major operators are entering this segment, either by building their own CDN, acquiring one, or partnering with existing CDN operators. In addition, the largest content providers, such as Google, Microsoft, and Yahoo, are expanding their private networks to handle their own content delivery.

A growing number of large content providers and retail ISPs has begun peering to exchange traffic directly. The growth in peering between content and access providers benefits both parties by reducing their respective IP transit requirements. While the growing use of CDNs and direct peering between content and access providers will divert some traffic from core networks, the need for IP transit will not disappear. Since it is not practical for all carriers to exchange all of their traffic via peering, transit will continue to play a crucial role in the global Internet.

The content on the preceding pages is a section from TeleGeography's Global Internet Geography

The work is based on sources believed to be reliable, but the publisher does not warrant the accuracy or completeness of any information for any purpose and is not responsible for any errors or omissions.

This work is for the confidential use of subscribers. Neither the whole nor any part of this publication may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopied, recorded or otherwise, without prior written consent from PriMetrica, Inc.

All rights reserved. © 2009 PriMetrica, Inc.

TeleGeography Research.

A Division of PriMetrica, Inc.

Washington, D.C. / San Diego / Exeter

U.S. tel: +1 202 741 0020 / U.K. tel: +44 1392 315567.

www.telegeography.com